

## Clinical Section

### Results with the Friedman Test for Pregnancy\*

By

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Of the various biological and chemical tests proposed during the last dozen years as suitable for diagnosis of pregnancy only two have been generally recognized as satisfying the trinity of demands (1) accuracy, (2) reasonable ease of performance, and (3) speed in yielding a result. These are the Aschheim-Zondek test with immature female mice, and its modification, the Friedman test with non-pregnant adult female rabbits.

These are actually tests for the presence of APL (prolan) in urine, this protein compound being formed by chorionic tissue from the foetal part of the placenta. Positive results may therefore be given in pregnancy, in incomplete abortion, in cases of hydatidiform mole, and in cases of chorionepithelioma, and when a test is reported positive the differentiation between these possible causes rests with the clinician and not with the laboratory reporting the test.

For a positive result sufficient APL must be excreted in urine to give a detectable reaction when a total of 20 c.c. or less of that urine is injected into a rabbit in two stages. When one bears in mind the amount of functioning chorionic tissue (or its precursor) present 10 days after a missed period (that is, some 14 or 15 days after ovulation), along with the fact that at this early stage of pregnancy a definite result is to be expected, the activity of this hormone of the ovum is obviously enormous.

Since January, 1934, Friedman pregnancy tests have been carried out for the medical profession of the Province of Manitoba and adjacent areas in the Department of Biochemistry of the University of Manitoba, under the auspices of the Medical Research Committee of the University. The work has been directed by a sub-committee consisting of Dr. D. S. Mackay, Dr. Ross Mitchell, Dr. A. J. Kobrinsky, and the writer.

The initial costs of the work were defrayed by grant from the College of Physicians and Surgeons of Manitoba. Since the work had to be self-supporting pre-payment of the fee (\$5.00) was laid down by the Committee as essential. In a few instances the test has been done without charge for purposes of research, but each such case has needed the consent of two members of the Committee. All requests for free tests in

cases of routine nature have been refused. No charge is made for repetition of a test where the first result is in any way doubtful.

The numbers of paid tests done during the five years 1934-38 were, respectively: 98, 142, 163, 272, 270 (total, 945). The corresponding figures including repetitions and 12 tests done for research are 109, 159, 192, 290, 289 (1,039 in all).

In these five years tests have been made for 231 physicians, of whom 170 reside in Greater Winnipeg (including St. Boniface), 36 in Manitoba (excluding Greater Winnipeg), 4 in Ontario, 20 in Saskatchewan, and 1 in Alberta. The number of paid tests done for individual physicians varied from 1 to 36. The majority of patients were from Greater Winnipeg, but the precise proportion cannot be stated, as many from outside this area had been referred to Winnipeg physicians, who sent us the urine-samples.

*Procedure.* Female rabbits weighing four pounds or more have been used. In a few instances, due to shortage of animals, ovaries of rabbits only recently obtained were examined before test by laparotomy, under sufficiently aseptic conditions, to ensure absence of haemorrhagic follicles and corpora lutea. Otherwise, each rabbit was segregated a month before use.

Two injections of urine into an ear vein were made with an interval of 24 hours between, each of 7 to 8 c.c. of a morning sample (because of its greater concentration). (If a morning sample was not available, a somewhat larger volume was injected). Twenty-four hours after the second injection the rabbit was killed by chloroform and its ovaries examined. Presence of haemorrhagic follicles or of craters (formed at ovulation, and preceding the haemorrhage into the follicles) or of both, constituted a positive result.

In a few instances, due again to shortage of test animals, rabbits were examined surgically, so that they could be used again after a sufficient interval. This procedure was used as seldom as possible, for it was economically cheaper to use a fresh rabbit for each test, largely because of the time involved in operation.

In the majority of cases one animal was used per test. If the result was at all uncertain we requested the physician to obtain a fresh sample of urine for repetition of the test. In cases of suspected hydatidiform mole, potential chorionepithelioma, or potential teratoma of the testis, additional tests with small amounts of urine (0.5 + 0.5 c.c.) were usually carried out. Schoeneck (1) has shown that the rabbit gives some degree of quantitative response.

To ascertain accuracy of the test, and to obtain as much information as possible bearing upon its usefulness, a questionnaire has been sent to the doctor concerned, along with each report, asking for the final clinical findings. When no reply has

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been received within six months, a second questionnaire has been mailed. The response has been gratifying. Final reports have been received from the physicians concerned in 784 of 887 tests carried out in the period January, 1934, to June, 1938, inclusive. Seventeen of these were on male patients. For 100 of the remainder no definite information could be given us. The remaining 667 tests can be analysed. (Insufficient results are as yet available to check the last six months of 1938).

*Accuracy of results.* In considering these, errors of interpretation must be distinguished from errors inherent in the method itself. In considering critically the notes made of our earlier results it is obvious to us now that we were sometimes too optimistic in labelling doubtful results positive; our doubt was due to presence of large, opalescent, pinkish follicles, not truly haemorrhagic. In most of such cases we were able to repeat the test and get accurate results, but in at least seven (reported by us "doubtfully" or "just positive") for various reasons this could not be done, and these errors are therefore errors of interpretation, which should be excluded in assessing the value of the test. As far as we know, no errors of this type have been made in the later tests. We have therefore divided the results into two groups, those for 1934-35, and those for 1936-June, 1938. They are shown in Table I.

TABLE I.

	Results of Tests	
	1934-35	1936-June, 1938
Negative Results		
Correct .....	102	238
Errors .....	1 (1.0%)	3 (1.3%)
Positive Results		
Correct .....	80	223
Errors of interpretation .....	7	
Errors of test .....	5 (5.4%)	8 (3.5%)
Total error of test .....	6 (3.1%)	11 (2.3%)

These figures may be compared with those of McHenry and Best (1933, 1937). They record 2.0 per cent. of errors in a total of 2,897 tests for which clinical results were available (2.7 per cent. of incorrect negatives, 1.2 per cent. incorrect positives).

*Causes of error.* Excluding errors of interpretation, there are several potential causes of error in the test. Some test animals are described as "refractory"; it is of course possible that of a large number of rabbits obtained from various sources a small percentage may have endocrine or other disorders which affect the test.

The urine specimen may have been taken too early in a pregnancy, so that the excretion of APL is too small to produce any effect on the test animal. In such a case a negative result is intrinsically accurate, though, as judged by the sequel, apparently wrong.

Certain endocrine disturbances, especially those affecting the pituitary, can yield false positive

reactions. McCullagh and Cuyler obtained 8 such reactions in 15 cases of pituitary disorders in non-pregnant women.

It is not improbable that missed abortion, especially ectopic abortion, is responsible for many apparently false positive reactions, so that the error of test, as calculated above, is always to be regarded as a maximum and possibly too high a figure. The following two cases from our series illustrate the difficulty sometimes experienced in checking the result of a test.

(1) A test on July 10, 1936, was faintly positive and repetition was requested. A second test on July 13 was made on two rabbits. One showed a markedly positive reaction, so that the second animal was not killed at that time. A curettage on the patient on July 16 showed decidua but no villi. Tubal pregnancy was therefore suspected and the patient was operated on on July 20. Nothing was found in uterus or tubes. Hence the second rabbit referred to above was killed and examined on July 23. There were definite large corpora lutea present, two in one ovary and three of more in the other. It is thus difficult to believe that our findings were incorrect, though impossible to state whether they were produced by APL or some other endocrine compound.

(2) The test was made a few days after a missed period. It was definitely positive, with large haemorrhagic follicles present in each ovary. The patient (living some distance from Winnipeg) soon afterwards wrote her Winnipeg physician that she was not pregnant. He considered that the test might well have been correct, but it remained in our list of apparent errors for 18 months, until the patient subsequently acknowledged that she had passed a foetus soon after the test was made.

*Cases associated with hydatidiform mole.* During 1934-38 our series included (a) two cases of hydatidiform mole, and (b) eight cases studied following expulsion of hydatidiform mole. The two cases prior to expulsion of mole are recent, and the subsequent history not yet definite. The other eight present some features of interest. In six of the eight, results were negative or became so on repetition. These results are as follows, the time intervals referring to time from expulsion of the mole:

- (1) Positive at 7 days, negative at 34 days; in good health 5 years later.
- (2) Negative at 67 days; in good health 3 years later and now seven months' pregnant.
- (3) Positive at 43 days, negative at 100 days. In good health 19 months later, with normal birth of a child in the interval.
- (4) Positive at 7 days, negative at 39 and 95 days.
- (5) Negative at 16, 39 and 106 days.
- (6) Negative at 17, 89 and 200 days.



These cases indicate that a positive APL reaction may disappear in just over a fortnight after expulsion of a mole, or may persist for six weeks, without chorionepithelioma subsequently developing.

In the seventh case (one of the earliest referred to us) three tests spread over a month were all definitely but not markedly positive. Hysterectomy was subsequently performed. The pathologist found no trace of chorionepithelioma tissue. A subsequent Friedman test was negative. We believe it probable that all four tests were correct.

In the last case of the series a hydatidiform mole was expelled on October 28, 1938, at the end of the fourth month of pregnancy. Subsequently, on the 33rd, 70th and 82nd days, positive Friedman tests were obtained. On the 82nd day a positive Aschheim-Zondek test also resulted. None of the tests were markedly positive though all were definite. On the 82nd day hysterectomy was performed, and a syncytioma found. A test 13 days later was negative. (A full report of this interesting case will be made by the clinician).

Our results are in general agreement with the series of 15 reported by Cosgrove in 1938, of which 3 progressed to chorionepithelioma. Of these 3, one gave positive results up to the 60th day with hysterectomy on the 68th day and subsequent good health. A second gave a positive test on the 4th day, and negative tests on the 12th, 18th and 21st days, but bleeding commenced on the 33rd day and Friedman tests were positive three times in the next 18 days, so that a total hysterectomy was done; the patient was well a year later.

Among Cosgrove's 12 cases which did not progress, negative tests were obtained as early as 6 and 7 days after expulsion, while positive tests were obtained as late as 29 days.

Mathieu (1937) states that 80 per cent. of the chorionepitheliomas in his series were found within 20 days of the passage of a mole. It seems to be the consensus of opinion that persistence of a Friedman or Aschheim-Zondek reaction for more than six weeks is strong indication of chorionepithelioma (cf. Zondek, 1937; Phaneuf, 1937).

*Cases associated with dead foetus.* The following cases have interest.

(1) L.M.P. August 3, 1933. The patient fell in November, 1933, since when there was irregular bleeding from the vagina. Symptoms suggested a dead foetus. A Friedman test February 6, 1934, was extremely positive, another, two days later, slightly positive. On February 9 the patient was delivered of a dead foetus weighing 210 gm., and estimated to be 17 weeks old. The placenta was partly detached, sufficiently to lead to death of the foetus, but enough was still attached and functioning to give a positive Friedman test.

(2) Patient had been pregnant for 7 months. The foetus was alive on February 1, 1936, and was believed to be dead on April 15. A Friedman test on April 22 was definitely positive. A dead foetus was delivered on April 24.

(3) L.M.P. July 15, 1936. A Friedman test on April 15, 1937, was negative. An abdominal hysterectomy was performed on April 22, and a 14 weeks' foetus removed, estimated to have been dead six months. The uterine contents were completely separated. (cf. Mitchell, 1937).

(4) Patient believed to be two months' pregnant. Friedman tests on November 11 and 15, 1937, were positive. Subsequent examination showed that the foetus had been aborted, but that a piece of retained placenta was responsible for the positive test. (Our series includes a second case, almost exactly parallel to this).

It is obvious that a positive test does not give definite information in cases of suspected intra-uterine death. Bishop (1935) states that a positive result may persist as long as three months after the death of a foetus. While any functioning chorionic tissue remains the test will be positive.

*Comments on other cases.* While we have carried out a number of tests in cases of presumed ectopic pregnancy our data are too incomplete to attempt to evaluate the accuracy of the test in this condition. (The degree of accuracy is undoubtedly less).

As bearing on the earliest stage of pregnancy at which a positive result can be expected with certainty, we have had a correct result five days after a missed period (in a case with a 24-25 days' cycle) and other correct results at seven, eight and nine days (remembering that estimation of dates of menstrual periods is only an approximation). When we can, we avoid doing the test until at least ten days have elapsed.

We have carried out tests on a number of urines from males in cases of suspected teratoma of the testis. Since the rabbit-test is not very quantitative, unless a number of animals are employed for each test (a costly procedure), and since the present classification of testicular tumours is by no means clear-cut, the Friedman test is not very satisfactory for such cases. Our results showed no consistent parallelism with the labelled histology of the tumours removed at orchidectomy, although in cases where metastases were known to be present positive results were always obtained.

Evidence concerning the result of a test has had to be given in one legal case. Since the test cannot be stated to be 100 per cent. accurate its results can only be regarded as contributory supporting evidence in any legal case.

Urines are frequently toxic to the test animal, which, in a small proportion of cases, dies within the 48-hour period. In several of these instances the toxicity appeared to be due to administration to the patient of nembutal or some other of the phenobarbital series of drugs. The toxicity of a urine probably in no way affects the result of the test if the animal survives the 48-hour period. Highly toxic urines can in most cases be rendered sufficiently innocuous by ether-extraction, followed by aeration.

In confirmation of other observers we have found that urines sent from a distance can be satisfactorily preserved by addition of boracic acid. About a third of a gram to 60 to 90 c.c. is adequate (roughly, as much as will go on a ten-cent piece to two to three ozs. of urine).

I desire to acknowledge the continued careful assistance of Miss Jean Guthrie, and Messrs. John Carmichael and Reginald Cotton in carrying out the tests.

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## Diagnosis of Gastric Lesions Aided by Gastroscopy\*

By

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Before 1932 gastroscopy was rarely performed, and by only a few operators. The risks of passing the instrument were not formidable but had nevertheless to be kept constantly in mind. Since that time Schindler's improved instrument containing as it does the flexible optical system invented by Wolf has reduced the hazards of the procedure to almost negligible proportions. In February, 1933, we began doing gastroscopic examinations at the Winnipeg General Hospital with the instrument devised by Roger Korbseh. During the past twelve months both types of instruments have been used and while the Schindler instrument is introduced with greater ease and safety, the Korbseh

instrument, once the stomach has been entered, has certain advantages over the flexible instrument. To begin with there is always a constant relationship between the optic and the small indicator on the eye-piece, and the details of the field of vision stand out more clearly.

Gastroscopy does not replace x-ray in the diagnosis of gastric lesions. It is to be considered only as an adjunct in selected cases, especially those in whom x-rays have been negative or difficult to interpret. If a gastroscopic clinic is to be established, it should be in the x-ray department so as to facilitate the closest possible co-operation between the radiologist and the gastroscopist. The earlier the disease can be inspected, the more value is to be derived from this co-operative effort. Because of the great expense in equipment, expensive repairs, etc., and the fact that a large experience is required before accurate interpretation of findings is possible, gastroscopy is not likely to come into general use. However, every large hospital in which much investigation of gastric disease is done, would increase its usefulness by the introduction of gastroscopy. The increased accuracy of observation and the opportunity of studying the course of intrinsic lesions are both important reasons why this should be done. It is axiomatic that whenever a lesion can be inspected directly the more indirect methods of examination should not be relied upon exclusively. This principle has been accepted in other fields such as bladder, rectum, oesophagus and bronchi. The stomach should be no exception to this rule.

#### *Indications for and Technique of Gastroscopy.*

The gastroscope can be passed with safety and with a minimum of discomfort in most patients into whose stomach a large Ewald tube can be introduced. Anything that prevents passage of stomach tube precludes gastroscopy, i.e., aortic aneurysm, organic stricture, diverticula of the oesophagus or oesophageal varices. The passage of the instrument is rendered difficult by the presence of prominent teeth or by a marked kyphosis.

#### *Indications.*

Gastroscopy is indicated:

1. In any patient in whom complete physical and radiographic examination is either negative or inconclusive, if the history suggests an intra-gastric lesion.
2. To confirm or check meagre or indefinite radiographic findings. This includes the differential diagnosis between early malignant and innocent gastric ulcers.
3. Before any purely exploratory upper abdominal laparotomy is performed.
4. In all post-operative stomachs with persistent or recurrent symptoms.
5. In all cases of unexplained hematemesis or melaena.
6. In all patients with persistent symptoms

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following cholecystectomy, especially where gall bladder pathology was doubtful.

The examination is performed with the patient in the fasting state. Routine preliminary sedative is not necessary although sometimes advisable with nervous patients. To give atropine in a physiological dose, would add greatly to the patient's discomfort. The pharynx and hypo-pharynx are anaesthetized with 2% solution of pantocaine using an especially curved applicator. A syringe enables the absorbent on the end of the applicator to be kept constantly moist without being removed and re-inserted. A large stomach tube is passed and the stomach contents evacuated.

The patient is turned on the left side, the hips flexed and the head extended on the trunk. The patient's head and trunk is supported by an assistant who stands behind him. This position accomplishes the twofold purpose of bringing the mouth in line with the oesophagus, and allowing the pylorus to gravitate toward the left, thus approximating it to the tip of the instrument. The instrument is now introduced in the same way as the stomach tube. The patient is instructed to swallow as the instrument reaches and passes through the hypo-pharynx. All the dangers of gastroscopy are connected with the passage through the oesophagus. Once the instrument has entered the stomach the risk is practically over. The instrument is passed on into the stomach as far as it will go. In over 75% of cases this should bring the pylorus into view. The stomach is inflated with air and the examination begun. Undue intra-gastric pressure results in eruction of gas, so that there is no danger of over distending the stomach.

In common with other tests a positive finding is usually conclusive and fairly readily interpreted. A negative finding gives rise to more difficulty for there are four small "blind areas" in which an intrinsic lesion might be overlooked, viz., close to cardia on both curvatures, on the greater curvature opposite the incisura, and on the lesser curvature distal to the incisura, in the J-shaped stomach. The normal gastric mucosa as seen through the gastroscope is a deep orange red color. The shade varies with the intensity of the light and the distance of the mucosa from the optic. The surface is thrown into irregular folds or rugae. At the incisura one sees a fold which at times actually separates the pyloric antrum from the cardiac end. Schindler has described this action and regards it as due to the musculus sphincter antri. The beginner could readily confuse this with the pyloric sphincter and misinterpret the pyloric antrum and cardiac end. The former is in constant motion; the latter can be observed to be quiescent for quite appreciable periods except for movements due to respiration. As this instrument is being withdrawn the cardiac opening of the stomach is seen as an oedematous-looking ridge, to be followed suddenly by the smooth pink mucosa of the oesophagus.

### *Gastritis.*

The introduction of the gastroscope has revived the interest of the profession in this entity. Many years ago the diagnosis of gastritis was commonly made. It rested largely on subjective evidence. We are now in a position to place this diagnosis on the accurate basis of objective findings.

Acute gastritis is frequently diagnosed especially when the history reveals any indiscretion in food or drink. To date we have not had the opportunity of examining the gastric mucosa immediately following such an attack. It is very likely that repeated episodes of this kind develop ultimately into some form of chronic gastritis.

There is no simple classification of gastritis based on etiological or morphological evidence. At present we have to content ourselves with describing gross anatomical changes in the gastric mucosa realizing that it is difficult to correlate the findings with the clinical picture presented by the patient. As in other gastro-intestinal disorders there is no constant relationship between the severity of the symptoms and the changes visible in the mucosa. Chronic gastritis either of the superficial or hyperplastic types may closely mimic chronic gall bladder disease, ulcer or malignancy. Physical examination and functional tests give little assistance in differential diagnosis in these cases. While hypoacidity and anacidity occur in 68% of cases; hyperacidity is present in 11% and a normal acidity in 21% (Henning). The x-ray evidence is at best only suggestive and open to wide variations in interpretation. In this condition the gastroscope is almost indispensable if absolute accuracy in diagnosis is demanded.

In the present state of our knowledge the classification of gastritis as suggested by Schindler is the most practical.

1. Superficial gastritis.
2. Hypertrophic gastritis.
3. Atrophic gastritis.
4. Gastritis in operated stomachs.

### *Superficial Gastritis.*

The superficial type has many variations. It may be localized or diffuse, primary or secondary to other lesions, e.g., ulcer or carcinoma. The mucosa is hyperaemic with occasional hemorrhagic spots. There is considerable increase in the mucus. The mucosa is more readily injured by the stomach tube or gastroscope. That these changes are transient and that they respond readily to treatment has been proven by repeated gastroscopy in these cases. It is also likely that such changes are the forerunners of the more serious chronic hypertrophic gastritis.

### *Hypertrophic Gastritis.*

Hypertrophic gastritis presents a variety of pictures depending on the severity and duration of the lesion. The mucosa is thrown into prominent folds deep red in color, markedly oedema-

tous, nodular and ragged. In the advanced cases multiple erosions are seen. They vary from pin point areas to erosions of moderate size. The aetiological factors in chronic gastritis are physical, chemical and bacterial irritation. The onset is insidious. The history of recurring epigastric distress extends over a period of months and years. Simple dietary measures control it at first. As the lesions progress pain and flatulence increase. Occasionally nausea is prominent. The gastric acidity varies, but as the disease progresses, hypo-acidity becomes the rule. This may be due partly to the neutralizing effects of the copious secretion of the alkaline mucus.

#### *Atrophic Gastritis.*

The mucosa presents a flat pale surface with prominent blood vessels distinctly visible. This type is characteristic of pernicious anaemia and may be observed in other marked chronic anaemias. The association of a gastric malignancy with a blood picture suggesting pernicious anaemia is not uncommon. Hurst considers atrophic gastritis to be a precursor of gastric malignancy.

#### *Post-Surgical Gastritis.*

One of the most fruitful fields for the gastroscopist is in the post-operative case. Radiological difficulties in such cases are notoriously great. Deformities seen radiographically are most difficult to interpret. It is with such cases that the gastroscopist can render greatest service to the radiologist and to the clinician. It has been shown that large numbers of cases returning with symptoms following resection or some anastomosis have symptoms due to gastritis. The percentage of gastritis causing symptoms is very much greater than stoma ulcer. Some observers suggest that most operative stomach cases show some gastritis. While microscopic examination may frequently demonstrate gastritis, gross study does not yield such a high percentage of positive findings. We have proven this to be the case in a number of patients with good functioning gastro-enterostomies who show a complete absence of superficial gastritis.

In this connection the following case is of interest, demonstrating that perianastomotic gastritis may be mistaken for stoma ulcer:

In 1922 a posterior gastro-enterostomy was performed for chronic duodenal ulcer. The patient remained perfectly well until October, 1935, when he had two attacks of mild epigastric pain. A month later he suffered a severe gastric hemorrhage. He developed a chronic secondary anaemia and a more or less constant epigastric distress, which persisted. In April, 1936, he was investigated. A barium series was negative. No evidence of stoma ulcer was demonstrable, and his gastric acidity was low. There was occult blood in the stool. He had marked dental sepsis, with pus exuding from the gums. Gastroscopic examination revealed a superficial perianastomotic inflammation, with pin-point haemorrhagic spots. The

jejunal mucosa was not observed. The stoma was patulous and according to the radiographic evidence was functioning well.

Another case reported for gastric hemorrhage in whom eight years previously a gastro-enterostomy had been done for proven duodenal ulcer. X-ray was interpreted as suggestive of hypertrophic gastritis. Gastroscopy showed the mucosa in the fundus of the stomach to be normal. In the pyloric end of the stomach was a carcinoma invading the gastro-enterostomy stoma. Subsequent examination of the radiographic made clear that the defect interpreted as due to hypertrophic gastritis did not show the linear markings or pattern one expects to see in hypertrophic gastritis.

#### *Gastric Ulcer.*

Gastric ulcers can be so accurately diagnosed by radiologist that in 95% of cases the information he provides cannot be added to by the gastroscopist. However in several cases we have been able to detect gastric ulcers that had not been reported radiologically. Two of these ulcers could not be demonstrated by any radiographic technique. Gastroscopic examination if negative does not absolutely rule out the presence of an ulcer. One should recall the existence of the so-called "blind areas" especially the one on the lesser curvature near the pylorus, and realize that a ulcer in this location may not be seen. Admittedly, routine gastroscopy is not essential in the diagnosis and treatment of ulcer. However, it is in this field that some of our most instructive observations have been made, first with the detection of lesion that had been overlooked, second in following the response to treatment and in proving that healing is not complete until some time after all radiographic evidence of ulcer has disappeared.

Gastric ulcers may be classified from the gastroscopic standpoint as follows:

1. *Superficial erosions*, usually multiple and frequently associated with varying degrees of chronic gastritis. These lesions are of clinical importance for the reason that they produce epigastric pain and frequently give rise to profuse haemorrhage. These superficial mucosal lesions can only be demonstrated by gastroscopy.

2. *Subacute ulcers* are seen as small dark punched-out areas in the mucosa. The surrounding mucosa is thick and oedematous for a considerable distance around the ulcer. *The presence of this oedema and local muscular spasm of the muscularis mucosae accentuates the apparent depth of the ulcer crater which radiographically often has the appearance of a deep penetrating ulcer.* As a matter of fact penetrating gastric ulcers are relatively uncommon and should not be reported as such by the radiologist unless the evidence is very conclusive. Subacute ulcers respond rapidly to medical treatment, the rapidity of the response being due more to the subsidence of oedema and relief of spasm than to the filling in of an ulcer crater.



3. *Chronic ulcers.* Gastroscoopically this type of lesion differs from the one just described in that the surrounding mucosa is practically normal in appearance. The ulcer is round or triangular, the edges sharply cut, the base shallow, greyish in color and fairly clean. Gastritis as an accompaniment of chronic ulceration is almost entirely absent in our series, an observation which is markedly in contrast with the conditions found in Central European clinics. In Germany the association of chronic gastritis with gastric ulcer is almost invariable, the pyloric antrum especially being involved. The differentiation between benign and malignant gastric ulcers is one sphere in which the gastroscopist can render valuable assistance.

Years ago three reasons seemed to call for surgical treatment in gastric ulcer:

1. The report of a penetrating ulcer by the radiologist, especially in a patient with a long ulcer history.
2. The presence of an hour-glass deformity in the stomach.
3. Uncertainty about the benignancy or malignancy of an ulcer.

Subsequent experience and latterly gastroscopic studies have shown that these are not definite indications for surgery. So-called perforating gastric ulcers are comparatively rare; the appearance of depth in the ulcer crater is due to the causes already mentioned. The hour-glass stomach is rarely the result of an organic constriction but is a radiographic artefact due to localized spasm. These cases can readily be gastroscopied and the absence of scar contracture proven. The differentiation between benign and malignant lesions seen through the gastroscope may be very difficult at one examination. Some cases that are difficult radiographically may be definitely diagnosed with the gastroscope. Others may require observation and examination from week to week under treatment in order that a definite decision be made. Still others require exploration and microscopic examination to complete the differentiation. One of the chief reasons for our failure to diagnose early gastric ulcer is the fact that the history is a rather atypical mixture of symptoms suggestive of gall bladder disease and peptic ulcer, but not definitely either one. When both these lesions are ruled out radiographically, one is apt to decide the symptoms are functional in origin and to treat them as such without giving due thought to the possibility of an intrinsic gastric lesion. The difficulty in making a clinical diagnosis is equalled by the difficulty experienced by the radiologist in demonstrating some gastric ulcers, especially those situated on the anterior or posterior gastric wall away from the lesser curvatures. Ulcers on the posterior wall of the pyloric antrum frequently present a history of flatulent dyspepsia with irregular pain and qualitative food effects.

Gastric ulcer differs from duodenal ulcer in some important respects which are best made clear

by contrasting the two lesions. Duodenal ulcer patients when diagnosed and put on treatment do not necessarily have to be followed by the clinician. They will unfailingly report if important developments such as perforation or hemorrhage arise. If the clinician has made an error in the diagnosis of the cause of the duodenal lesion, the error is not likely to be disastrous. Gastric ulcer patients, on the other hand, must be kept strictly under the observation of the clinician for the following reasons:

1. In order that the response to treatment be determined and proof of complete healing obtained on the basis of history, radiographic and if possible gastroscopic examinations.

2. In order to make sure that the diagnosis has been correct, and the lesion is actually a benign one and not an early malignancy. Any gastric ulcer patient who in four weeks fails to show a satisfactory response to medical treatment should be advised to submit to surgery. Every gastric ulcer patient should be informed that in a month's time, regardless of how he feels, the entire problem must be reconsidered, including a re-check of the radiographic examination.

#### *Polyposis Ventriculi.*

The gastroscope is used in polyposis to confirm the radiographic diagnosis, and to determine the proximity of the tumour to the oesophagus. In this way the extent of the resection required is gauged. The tumour projects into the lumen of the stomach, is sessile, and is purplish in color. We have seen only a small group of nine cases, four of which have been gastroscopied. In two of these cases malignant changes had occurred in the polypi, and this was proven by subsequent study. This change was not grossly evident on gastroscopic examination.

#### *Carcinoma of Stomach.*

The main reason for becoming interested originally in gastroscopy was the hope that one would be able to establish the diagnosis of carcinoma at an earlier stage of the disease. To date this hope has not been realized. Over a six-year period (February 1933-39) during which time over 225 stomachs have been examined, although we have been able to exclude carcinoma in some, and to establish the diagnosis in others, this does not warrant any extravagant claims for gastroscopy in this particular field. No progress can be made in the early diagnosis of carcinoma of the stomach until patients in the cancer age with recent indigestion are thoroughly investigated, and secondly until there is closer collaboration between the clinician, the radiologist and the gastroscopist. An even more important requisite to progress is the education of the public to the necessity of those over forty-five seeking early advice for recent abdominal distress. When we realize that 25% of all the deaths from cancer in Canada are due to cancer of the stomach, we must be impressed by the importance of early diagnosis and radical surgical treatment of this condition.

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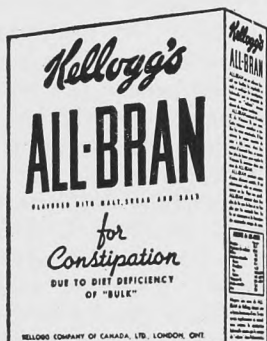
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We have had the opportunity of examining the polypoid lesion projecting into the gastric lumen and the malignant ulcer, excavating the stomach. The edge of the malignant ulcer is ragged and dark in color. The base is covered with necrotic material.

Recently the value of the gastroscope in differentiating extra-gastric from intra-gastric lesions has been shown. A patient had vague upper abdominal distress. Barium series showed a filling defect at the cardiac end suggesting a carcinoma. The gastroscope showed no mucosal lesion but a bulging which has since been proven to be due to a retroperitoneal lymphoma.

We believe it has been established that gastroscopy has a definite though limited field of usefulness. It is a permanent arm in our diagnostic equipment. In the small early mucosal lesion it is superior to any other method of examination. In the grosser lesion it is only complementary to radiography. There is every reason to believe that there will be further improvements in the construction of the instrument so that even the taking of biopsies may eventually be possible.

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## Special Articles and Association Notes

### The Manitoba Medical Association Review

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### Annual Meeting of the Canadian Medical Association Montreal, June 19, 20, 21, 22 and 23, 1939

The provisional programme for the Annual Meeting of the Canadian Medical Association has been published in the March number of the Canadian Medical Association *Journal*. The papers will be given as usual at Sectional Meetings including the Sections of Anaesthesia, Dermatology, Historical Medicine, Gynaecology, Military Medicine, Obstetrics and Gynaecology, Ophthalmology, Otolaryngology, Paediatrics, Radiology, Rheumatic Diseases, Surgery, Urology: and in addition, certain papers will be read at general sessions.

Several medical men from Winnipeg will be reading papers, including Drs. A. M. Davidson, Ross Mitchell, Lennox Bell, C. W. Walton, J. D. McQueen, Bruce Chown, A. Gibson, H. D. Morse and J. D. Adamson.

An interesting innovation this year will be the Round Table and Instructional Conferences which will take place from 8.30 to 9.25 on the mornings of Wednesday, Thursday and Friday, in the following Sections, Anaesthesia, Dermatology, Medicine, Obstetrics and Gynaecology, Ophthalmology, Otolaryngology, Paediatrics, Radiology, Surgery and Urology.

There will be several visiting speakers.

Professor E. P. Cathcart, Professor of Physiology at the University of Glasgow, will deliver an address to the annual meeting and will also speak in other centres in Canada next summer on Nutrition. Professor Cathcart is an international authority and a pioneer in investigations into problems of nutrition and metabolism.

Other guests will be Dr. A. J. Bedell, of Albany, N.Y., an ophthalmologist of national reputation, who has made outstanding contributions to the pathology of the retina; Dr. Clara M. Davis, of Winetka, Ill., an authority on the modern feeding of infants; and Dr. Norman Miller, formerly of the University of Iowa, and now Professor of Obstetrics and Gynaecology at the University of Michigan. Professor Miller is the author of numerous articles dealing with his chosen specialty, and he will speak at one of the sessions, in June, on the subject of Dysemorrhoea.

Dr. K. A. MacKenzie, Professor of Medicine at Dalhousie University, Halifax, President of the Canadian Medical Association, will give one of the more important addresses in General Sessions in his capacity as Retiring President.

From a purely medical point of view, Montreal is one of the most interesting cities in Canada in which to hold an annual meeting. With its large population and well-equipped hospitals, there is an unusual wealth of clinical material. In addition, the opportunity of seeing the work of our French Canadian colleagues is a stimulating experience.

Montreal offers unexcelled opportunities for the enjoyment of the leisure time available at any medical meeting. Although it is the largest city in Canada and the second largest port on the north Atlantic, yet one is continually reminded of its historical past. The city has numerous historical buildings and museums, one of the most interesting of which is the Chateau de Ramezay. The Chateau was built in 1705 by the French governor whose name it bears. Since 1847 it has served many purposes and was finally converted into a museum. There is in it a wealth of historical relics and interesting documents. Nearby the Chateau is the interesting Bonsecours Church; the sailors church and the Bonsecours Market. In the heart of the city is Mount Royal, a natural park with a large Chalet at its summit. In addition, Montreal offers theatrical and musical entertainment unsurpassed by any city in Canada.

With the inauguration of the Trans-Canada Airways passenger service, Montreal is now very near in time to Manitoba.

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## Annual Meeting of the Manitoba Medical Association

### Scientific Programme

Members of the Manitoba Medical Association are invited to submit papers for the scientific programme of the annual meeting in September 1939. Those wishing to deliver papers should forward copies or an abstract. Applications will be received up to May 1st. The selection will be made by the Scientific Programme Committee.

Suggestions from members as to particular subjects which they would wish to have discussed are also invited.

Communications may be sent to the Honorary Secretary, Manitoba Medical Association, 10 Medical Arts Building, Winnipeg. They will be sent on to the Committee for consideration and action.

### Civil Service of Canada

**Bacteriologist, Male, Department of Pensions and National Health, Ottawa, Ont. --- \$3,000 per Annum**

Comp. No. 28756. A Bacteriologist, Male, for the Laboratory of Hygiene, Health Branch, Department of Pensions and National Health, Ottawa, at an initial salary of \$3,000 per annum. In the event of permanent appointment this initial salary will be increased upon recommendation for meritorious service and increased usefulness at the rate of \$120 per annum until a maximum of \$3,720 has been reached.

**Duties.**—Under direction, to undertake the potent testing of various biological products such as antiserum and bacterial vaccines, and to conduct research in connection therewith; to conduct special bacteriological investigations; and to assist in the general work of the laboratory.

**Qualifications required.**—Graduation from a university of recognized standing in medicine or chemistry with at least two years of post-graduate training in bacteriology, biochemistry and immunology; and at least three years of laboratory experience in the same field, one year of which must have been in a position of responsibility; a knowledge of and experience in methods of standardization of biological products.

While no definite age limit has been set for this competition, age may be a determining factor in making a selection.

**Nature of examination.**—A rating on education and experience will be given from the sworn statements supporting documents and other evidence submitted by applicants on and with their application forms. Candidates are requested to give full particulars regarding their technical training and experience, especially as they bear on the qualifications for and the duties of this position. An oral examination will be given if necessary in the opinion of the Commission. No examination fee is required.

An eligible list valid for a period of one year may be established.

### RAWSON—MacCULLOUGH

On March 14th, 1939, at Knox Church, Winnipeg by Rev. James W. Clarke, M.C., Noel R. Rawson, M.B. B.S. (Lond.); D.P.H. (Tor.); eldest son of Mr. Christopher Rawson, of Whalley Range, Manchester, to Jean Anna MacCullough, daughter of the late Dr. James Henry MacCullough, of Owen Sound, Ont., and of Mrs. MacCullough, of Harald Apts., Winnipeg.

## Department of Health and Public Welfare

### NEWS ITEMS

Note: The following is the first instalment of an article on "Focal Infection with particular emphasis on preventive aspects for individuals between 21 and 45 years of age" written by W. J. Stainsby and Edith E. Nicholls from the New York Hospital and Department of Medicine, Cornell University Medical College, New York City, and recently published in the Bulletin "Preventive Medicine". The second and last instalment of this article will appear in the next issue of the Manitoba Medical Association Review:—

**"FOCAL INFECTION (FOCI INFECTION): WITH PARTICULAR EMPHASIS ON PREVENTIVE ASPECTS FOR INDIVIDUALS BETWEEN 21 AND 45 YEARS OF AGE:**—Local infections unquestionably affect the health of a great many individuals. Certain principles concerning their relationship to disease elsewhere in the body have been definitely established; others have been promulgated that are not based on controlled clinical or animal experiments and their application in the practice of medicine has been entirely empirical. The purpose of this article is to present the various aspects of focal infection with emphasis on prevention and to endeavor to separate well established procedures from those that are experimental or of questionable value.

#### GENERAL PRINCIPLES OF FOCAL INFECTION

"A focal infection may be defined as a localized infectious process, often chronic and symptomless, that may occur anywhere in the body and which is potentially capable of producing either other localized infections or generalized disease. In its widest meaning, the term could be used to denote the primary site of entrance of organisms for almost all bacterial diseases, an example of which is the role played by localized areas of the intestinal mucosa in the development of typhoid fever. In the generally accepted use of the term, however, and the one used here, a more restricted meaning is intended and the 'portal of entry' for the various well understood infectious diseases is not included."

**"Bacteriology.** Several pathogenic microorganisms are capable of producing focal infections. The various streptococci are the ones most frequently encountered in these conditions and are particularly prone to invade the tonsils, accessory nasal sinuses and the apices of the teeth. With the exception of virulent hemolytic varieties, these streptococci tend to produce chronic, long drawn out diseases. The staphylococcus, likewise, is frequently encountered in focal infections, particularly in the bones, accessory nasal sinuses, and the prostate. It is usually a more virulent organism than the streptococcus and tends to produce more serious diseases that often terminate in death. The gonococcus produces its focus in the prostate gland, the fallonian tubes, or other glands along the genital tract. When disseminated in the body this organism causes serious and often fatal lesions, and particularly attacks the joints, the heart valves, or produces a septicemia. The tubercle bacillus usually forms its focus in the lymph glands and pulmonary tissues. The meningococcus, pneumococcus, colon bacillus, and several other microorganisms may at times produce foci of infection.

**"Mechanism of Infection.** There are three definitely known methods by which microorganisms in infected foci may produce disease elsewhere in the body:

1. By dissemination of the organisms themselves.
2. By dissemination of the products of the organisms.
3. By producing an allergic condition in the host.

"With the first method of producing disease from a focus, the organisms pass by way of the blood stream or lymph channels to other parts of the body. This mechanism is seen clearly in gonococcus arthritis. In this disease the organisms can frequently be isolated from the focus of infection in the genital tract as well as from the affected joints, and rarely from intervening lymph structures and the blood stream.

"With the second method of producing disease from a focus, toxic products of the organisms enter the general circulation and produce widespread disease. This mechanism can best be illustrated by reference to diphtheria. In this disease, the diphtheria bacilli generally remain at the site of infection in the throat, while the toxic products elaborated there enter the circulation and produce degenerative changes in the heart muscles, kidneys, spleen, and peripheral nerves. While diphtheria is not an example of focal infection, it is generally accepted that a similar mechanism operates at times in these conditions.

"With the third method of producing disease from a focus, the localized infection produces what is known as an allergic condition in the host. Following repeated injections of a foreign protein into the body, urticarial, hemorrhagic, and arthritic manifestations often occur. These clinical conditions, so produced, are obviously non-infectious in character. While this mechanism of producing disease is not well understood, there is adequate evidence that it sometimes plays a prominent part in the production of disease and that bacterial proteins may be as potent as other types in producing the allergic state.

**"Factors Determining Infection.** It may be assumed that practically all human beings at some period in their life harbor foci of infection, yet relatively few of them develop diseases that could be attributed to them. This situation is remarkably similar to that which pertains to many of our contagious diseases. A very high percentage of the population is known to be exposed to tubercle bacilli, often repeatedly, without contracting tuberculous disease. Likewise, with some of our most serious epidemics caused by various infecting agents and where exposure is probably widespread for a particular group of people, only a relatively small number develop disease. It should not be surprising, therefore, that with patients harboring foci of infection only a small percentage actually develops disease that could be caused by their presence.

"Various factors play their roles in deciding whether or not an individual will contract disease from a focal infection. The most important of these are:

1. Virulence of the infecting organisms.
2. Kind, location, and extent of the infected tissue.
3. Resistance of the host.

"The virulence of the infecting organism is a very important factor. A tonsil, for instance, infected by a virulent hemolytic streptococcus is much more likely to cause serious disease than when the organism is less virulent. This virulence is increased by passing from patient to patient, especially during the winter months when passage becomes more frequent.

"The kind, location and extent of the focal infection is another important factor in initiating disease. A tuberculous focus in lymphoid tissue, because of the ease by which such infections can be distributed to various parts of the body through lymph channels and blood vessels, is more serious than a subcutaneous infection by the same organism. A pyogenic localized infection of the face above the mouth is more serious than one on the lower part of the face, due to the proximity of important structures. In addition, a small



focus such as a low grade infection of a finger is less likely to produce serious disease than a large one which has a greater opportunity to spread along the lymphatics and cause abscesses elsewhere in the body or a septicemia.

"The resistance of the host is another very important factor in determining whether or not a patient will develop serious disease from a focal infection. The resistance may be a natural inherited immunity, one acquired from contracting the disease, or produced by vaccination. These various immunological factors vary from time to time depending on the general health of the individual. Worry, overwork, trauma, undernutrition, and other diseases all tend to lower temporarily the immunity of the individual, and it is during the temporary periods of lowered resistance that generalized disease is likely to develop from focal infections.

#### TONSILS AND OTHER LYMPH TISSUE OF THE NASO-PHARYNX

"The faucial tonsils and other lymph tissues of the nasopharynx are considered together as they are prone to develop similar infections at the same time.

"Chronically diseased tonsils are apparently the result of modern civilization. Frequent development of upper respiratory infections due to overcrowding tends to so injure and destroy the normal structure of this organ that instead of serving its original purpose of defending the body from infection, it becomes chronically infected tissue and a source of danger to the individual. Dust and fumes, and poor artificial heating contribute their roles to the production of diseased tonsils.

"Considerable difficulty is often experienced in determining whether or not the tonsils of an individual are diseased. When they are grossly enlarged, and localized infection develops in the Eustachian tubes, sinuses or throat because of mechanical factors, the diagnosis is relatively easy. In adults, however, diseased tonsils are generally not enlarged and the diagnosis has to be based on signs and symptoms and the patient's general health.

"For the prevention of serious disease, then, tonsils should be considered unhealthy whenever a patient develops a peritonsillar abscess or frequent attacks of acute tonsillitis, and their removal should be ordered as soon as the patient's general condition warrants it. In the absence of these clear cut evidences of infection, the decision relative to the state of the tonsils is made from the history of chronic or repeated sore throat, from the lack of mobility of the tonsils, their redness, and the presence of pus that can sometimes be expressed from them. If the patient is suffering from a disease, the etiology of which is believed to be related to a focus in the tonsils, tonsillectomy is indicated even if these structures appear healthy, providing other foci have been carefully searched for and not found, and providing the patient fails to respond to other forms of therapy.

"It must be constantly borne in mind that healthy tonsils serve a useful purpose; they are the individual's first line of defense against infections of the throat and they tend to limit and shorten such infectious processes. Tonsils, therefore, should not be removed indiscriminately.

"Diseased tonsils are responsible for a wide variety of ailments. The relationship between them and acute nephritis is well established. They are also often responsible for unexplained fever, for recurrent otitis media, serious infections deep-seated in the neck, some cases of rheumatoid arthritis, neuritis, and the indefinite group that come under the heading of myositis. They are also responsible at times for general debility, anemia, and various indefinite and vague symptoms.

#### TEETH

"Focal infections of the teeth include pyorrhea, pyorrheal abscesses, and infections at the apex. The importance of pyorrhea without abscess formation is not definitely established. The ease with which it drains into the mouth minimizes the possibilities of infection from this source directly invading the bloodstream or lymph channels. The chief dangers from pyorrhea seem to consist in the possibility of the discharge infecting other structures of the mouth, throat and various tissues along the bronchial tract as well as in producing deep seated pyorrheal abscesses without free drainage into the mouth. As a health measure, pyorrhea should be treated and any mechanical factors producing it corrected.

"Chronic apical and pyorrheal abscesses sometimes are difficult to diagnose. Localized pain is a suggestive symptom and tenderness on pressing the tooth may be elicited. The chief difficulty however lies in the fact that apical abscesses usually do not form on a tooth with an intact nerve supply, and because of this, the absence of pain and tenderness do not rule out such abscess formations. The x-ray is our most important diagnostic aid for dental disease and it often shows clearly deep seated infections that otherwise could not be detected. On the other hand, a negative dental x-ray does not rule out apical infections because the exposure is taken only in one plane and the abscess may be missed because of superimposed structures. Sometimes it is necessary to repeat x-rays at intervals to demonstrate the presence of these infections.

"Dead teeth often constitute a serious problem for the dentist and physician. They are not necessarily the seat of an infectious process as demonstrated by extraction, and individuals have been known to retain devitalized teeth for many years without developing serious disease. Therefore, in a healthy individual dead teeth without demonstrable infection need not be extracted but should be studied by x-ray at intervals of six months or one year. On the other hand, if a patient is suffering from a disease that is believed to be caused by a focus of infection, more radical procedures are advised. If such patients do not respond to other forms of therapy and no other focus of infection is found, extraction of dead teeth is justified on the basis that they may be the seat of undetectable infection. This should not be done, however, until other therapeutic measures fail to produce recovery.

"Once a diagnosis of apical infection is established, treatment is indicated. Many such infections have been eliminated by various methods without the extraction of the tooth, but such methods of therapy always leave a certain amount of uncertainty both as regards the elimination of the infection and the dissemination of it to other parts of the body. It is far safer to extract infected teeth although the attitude of the patient may make extraction inadvisable.

"Dental infections are responsible for a wide variety of diseases including local infections around the mouth, rheumatoid arthritis, neuritis, and myositis.

#### THE ACCESSORY NASAL SINUSES

"Like the tonsils, infection of the accessory nasal sinuses is often the result of rhinitis and other upper respiratory diseases. Repeated attacks of acute sinusitis usually produce a chronic condition. In addition, infection of the maxillary sinuses may be caused by a dental abscess.

"The diagnosis of a chronic sinusitis is often difficult. The localized headache resulting from the condition usually follows the distribution of the trigeminal nerve. Infection of the sphenoidal sinuses, however, gives rise to occipital headache. A chronic discharge from the nose or back of the throat is indicative of sinusitis. When carefully taken, the x-ray is the most important diagnostic measure, and gives reasonably accurate

information as to whether or not the sinuses are diseased.

"The sinuses are very important as foci of infection. For the prevention of serious disease, acute or chronic sinusitis should be treated and eradicated if possible. Beneficial results are often obtained by improving drainage and sometimes by periodic washings. Improved hygienic measures and change of abode to a warm dry climate such as prevails in Arizona are beneficial.

"Chronically infected sinuses are etiologically important for chronic bronchitis, bronchiectasis, local infection about the face, bronchial asthma, rheumatoid arthritis, and the various infections of nerves and muscles.

### THE PROSTATE GLAND

"The prostate receives its importance as a focus of infection primarily because of the frequency with which it is infected with the gonococcus. Prostatic infections with this organism frequently produce arthritis, and inflammatory conditions in other parts of the genital tract. Occasionally septicemia and endocarditis result from this type of infection.

"The prostate may also become chronically infected with the colon bacillus, the staphylococcus, and the streptococcus with the production of polyarthritis and cystitis as well as various other conditions.

"Chronic infections of the prostate should receive prompt attention both for the prevention of disease elsewhere in the body as well as for the treatment of these complications once they have developed. The treatment of prostatic infections is usually successful but must be continued for a long period of time.

### THE ENDOCERVIX

"The cervix is a frequent site of chronic infection and examination of smears or cultures made from the exudate of such inflamed tissue generally reveals a wide variety of microorganisms, although the gonococcus, streptococcus, and staphylococcus may predominate.

"The relationship of gonococcus infections in lesions of the cervix to disease elsewhere in the body is well established. It is capable of initiating infection in other parts of the genital tract as well as a generalized arthritis, septicemia, and endocarditis.

"The importance of the cervix as a focus of infection produced by organisms other than the gonococcus has not been definitely established. Bacteriologic studies indicate clearly that both anaerobic and aerobic streptococci are frequent inhabitants of the chronically diseased endocervix. Morphologically, it is a complicated glandular structure with numerous small ducts leading to the cervical canal. Theoretically, obstruction to free drainage through these ducts should frequently occur and dangerous foci of infection result. Clinically, however, localized non-gonococcal infection of the cervix has never been proven a serious menace to the health of the individual, and further work must be done before it can be considered established.

(To be continued in May issue)

## COMMUNICABLE DISEASES REPORTED

Urban and Rural — February, 1939

### Occurring in the Municipalities of:

**Mumps:** Total 202—Winnipeg 120, St. James 31, Kildonan East 18, Tuxedo 18, Morris Rural 4, Unorganized 4, Morris Town 2, Shoal Lake Village 1, St. Andrews 1, St. Vital 1 (Late Reported: January, St. James 2).

**Scarlet Fever:** Total 168—Brandon 57, Winnipeg 47, Shoal Lake Village 12, Boissevain 7, Brokenhead 5, Kildonan West 3, South Norfolk 3, Assiniboia 2, Morton 2, Portage Rural 2, Rivers 2, St. Boniface 2, The Pas 2, Unorganized 2, Coldwell 1, Daly 1, Dufferin 1, Fort Garry 1, North Norfolk 1, Portage City 1, Shoal Lake Rural 1, Springfield 1, St. Vital 1, Turtle Mountain 1, Whitehead 1, Whitewater 1 (Late Reported: January, Brandon 2, Carman 2, Cameron 1, Dufferin 1, Rivers 1).

**Chickenpox:** Total 112—Winnipeg 80, St. Boniface 10, Flin Flon 7, Kildonan East 3, Arthur 2, Unorganized 2, Minnedosa 1, Portage City 1, Selkirk 1, Transcona 1 (Late Reported: January, St. Boniface 3, Flin Flon 1).

**Measles:** Total 84—Argyle 19, Boissevain 19, Victoria 19, Kildonan West 6, Winnipeg 5, Lorne 5, St. James 2, St. Vital 2, Daly 1, Louise 1, Oakland 1, Strathclair 1 (Late Reported: January, Boissevain 2, Louise 1).

**Influenza:** Total 63—Brandon 52, Unorganized 10, Winnipeg 1.

**Whooping Cough:** Total 62—Winnipeg 31, Unorganized 19, Lawrence 5, Kildonan West 2, Gilbert Plains 1, Minotnas 1, Rivers 1, St. James 1 (Late Reported: January, Blanchard 1).

**Tuberculosis:** Total 34—Winnipeg 18, St. Vital 2, Assiniboia 1, Brokenhead 1, Dauphin Rural 1, Dufferin 1, Flin Flon 1, Gimli Rural 1, Gladstone 1, Hanover 1, Lorne 1, Mossey River 1, Sifton 1, Ste. Anne 1, St. Boniface 1, Unorganized 1.

**Diphtheria:** Total 14—Winnipeg 3, Morris Town 2, Hanover 2, Kildonan West 1, St. Clements 1 (Late Reported: January, St. Clements 4, St. Andrews 1).

**Erysipelas:** Total 6—Winnipeg 4, Argyle 1, Portage City 1.

**Typhoid Fever:** Total 5—Brokenhead 1, Ste. Anne 1, Winnipeg 1 (Late Reported: January, Portage Rural 2).

**German Measles:** Total 5—Brandon 5.

**Lobar Pneumonia:** Total 5—Brandon 1 (Late Reported: January, Montcalm 2, Brandon 1, Morris Rural 1).

**Smallpox:** Total 4—Shell River 1 (Late Reported: January, Roblin Town 2, Shell River 1).

**Septic Sore Throat:** Total 3—Rivers 2, Unorganized 1.

**Lethargic Encephalitis:** Total 1—Pembina 1.

**Undulant Fever:** Total 1—Brenda 1.

**Venereal Disease:** Total 145—Gonorrhoea 70, Syphilis 75.

## DEATHS FROM ALL CAUSES IN MANITOBA For the Month of January, 1939

**URBAN**—Cancer 37, Pneumonia 10, Lobar Pneumonia 7, Tuberculosis 6, Influenza 5, Scarlet Fever 1, Erysipelas 1, Typhoid Fever 1, all others under one year 13, all other causes 157, Stillbirths 18. Total 256.

**RURAL**—Cancer 27, Pneumonia 18, Tuberculosis 15, Lobar Pneumonia 10, Influenza 4, Diphtheria 1, Scarlet Fever 1, Syphilis 1, Infective Dysentery 1, all others under one year 26, all other causes 122, Stillbirths 11. Total 237.

**INDIAN**—Tuberculosis 6, Pneumonia 2, Measles 1, Lobar Pneumonia 1, all others under one year 6, all other causes 3, Stillbirths 2. Total 21.

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